

0.3
Rewrite claim 4 as follows:

91
4. (Amended) The alloy of claim 1 including about 43 to 57 nickel, about 21.5 to 27 chromium[,], and about 12.5 to 17.5 cobalt [and about 4.5 to 9 molybdenum].

82
REMARKS

Claims 1-19 are presently pending in the application. Claims 1-19 stand rejected under 35 U.S.C. §103(a) as being obvious over U.S. Patent No. 5,780,116 to Sileo et al.

* A Declaration of Gaylord D. Smith under 37 C.F.R. §1.132 is submitted herewith traversing the instant rejection. The Examiner's reconsideration and favorable action are respectfully requested in light of the Smith Declaration, taken with the amendments made hereinabove as well as the following remarks.

The present application contains three independent claims, viz., claims 1, 7, and 13. All of the independent claims are directed to a nickel-base alloy. Claim 1 defines the broadest alloy composition of the present invention consisting of, in weight percent, about 42 to 58% nickel, about 21.5 to 28% chromium (as amended), about 12 to 18% cobalt, about 4.5 to 9.5% molybdenum (as amended), about 2 to 3.5% aluminum, about 0.05 to 2% titanium, at least one microalloying agent selected from the group consisting of about 0.005 to 0.1 yttrium and about 0.01 to 0.6 zirconium. The nickel-base alloy defined in claim 1 further consists of about 0.01 to 0.15 carbon, about 0 to 0.01 boron, about 0 to 4 iron, about 0 to 1 manganese, about 0 to 1 silicon, about 0 to 1 hafnium, about 0 to 0.4 niobium, about 0 to 0.1 nitrogen, plus incidental impurities and deoxidizers.

Claim 2 is dependent from claim 1 and further requires about 8 to 20 weight percent γ' phase. Claim 3 is, likewise, dependent from claim 1 and specifies a γ'' phase of less than about 2 weight percent. Claim 4, likewise, is dependent from claim 1 and further defines the nickel content as about 43 to 57%, the chromium content of about 21.5 to 27% and the cobalt

content of about 12.5 to 17.5%, as amended herein. Claim 5 also depends from claim 1 and further defines the aluminum content as about 2.25 to 3.5% and the titanium content of about 0.06 to 1.6%. Claim 6, likewise, depends from claim 1 and further limits the zirconium, carbon and boron ranges.

Independent claim 7 is similar to independent claim 1 but further refines the nickel range as about 43 to 57%, the chromium range of about 21.5 to 27%, the cobalt range of about 12.5 to 17.5% and the molybdenum range of about 4.5 to 9%. Lower limits are specified for the microalloying agents as well as the carbon, boron, silicon, hafnium and nitrogen constituents. This is, likewise, true with respect to independent claim 13 which defines the nickel content as about 44 to 50 wt.%, the chromium content of about 22 to 27 wt.%, the cobalt range of about 13 to 17 wt.% and the molybdenum range of about 5 to 8.5 wt.%.

The nickel-base alloy defined in claims 1-19, as amended, is neither disclosed nor fairly suggested by Sileo et al. The Examiner has relied upon the passage set forth in column 7, lines 48-59 of Sileo et al. as a basis for rejecting Applicants' pending claims. It should be noted that in Table 1 appearing in column 7 of Sileo et al., the compositions of three alloys, namely, Alloy 1, Alloy 2 and Alloy 3, are set forth as being suitable matrix materials having the necessary oxidation resistance for practicing the invention. The drafter of the Sileo et al. patent then chose the minimum and maximum values from these Alloys 1, 2 and 3 of Table 1 as the broad ranges set forth in column 7, lines 48-59 which were relied upon by the Examiner in rejecting the instant claims. A careful study of this broad composition was made by the Declarant, Gaylord Smith, and his conclusions are set forth in paragraphs 6 and 7 of the attached Smith Declaration. Mr. Smith indicates that he has studied the compositional ranges of the so-called nickel base alloy relied upon by the Examiner and set forth in column 7, lines 48-59 of the Sileo et al. patent. Mr. Smith added all of the maximum amounts of the listed alloy constituents and found that these

enumerated alloy constituents (less Ni) total 115.1%. Bearing in mind that the Sileo et al. alloy has a "balance essentially nickel," there can be no Ni present in the Sileo et al. alloy when all of the other constituents are present in their maximum amounts as set forth. Conversely, when Mr. Smith added up all of the minimum amounts of the same listed alloy constituents (except Ni), he found that these constituents totaled 8.1%, thus leaving a balance of 91.9% nickel. Accordingly, Mr. Smith calculated that the so-called nickel base alloy disclosed by Sileo et al. and relied upon by the Examiner has a Ni range of 0 to 91.9%.

In paragraph 7 of the Declaration, Mr. Smith concludes that the disclosure of Sileo et al. set forth in column 7, lines 48-59 and subsequently adopted by the Examiner, is meaningless and non-enabling to persons skilled in the art due to the undue breadth of the constituent ranges. Mr. Smith concludes that the only nickel base alloy ranges disclosed by Sileo et al. and meaningful to those skilled in the art are those set forth in Table 1 in column 7, lines 19-44, identified as Alloy 1, Alloy 2 and Alloy 3.

Declarant Smith further states that it was improper for Sileo et al. to select the minimum and maximum values for a given constituent in Alloys 1, 2 and 3 of Table 1 taken collectively, since each of these alloy compositions represents a unique composition with specific combinations and amounts of alloy constituents present (or not present) in each alloy. Mr. Smith further states that one skilled in the art would not then establish broad compositional limits for an alloy by combining the maximum and minimum values of three unique alloy compositions, as was done in column 7, lines 48-59 of Sileo et al., because the resultant combined composition is fictitious, as evidenced by the fact that the maximum amount of alloy constituents without nickel being present totals 115.1%. Thus, the resultant alloy could hardly be called a nickel base alloy since no Ni is present in the composition. In addition, with a calculated nickel range of 0 to 91.9%, Sileo et al. hardly teaches one skilled in the art anything meaningful with respect to

Applicants' presently claimed alloy which, in the broadest claim 1, specifies a nickel content of about 42 to 58 wt.% nickel.

Mr. Smith, in paragraph 8 of the Declaration Under 37 C.F.R. §1.132, states that he has compared the alloy ranges of Alloys 1-3 of Table 1 of Sileo et al. with pending claims 1-19 of the instant application. According to Mr. Smith, only Alloy 2 of Sileo et al., having a chromium content of 24 to 26%, bears any possible relevance with respect to the chromium content of about 21.5 to 28% of claim 1 of the instant application. Mr. Smith goes on to state that the balance of the major constituents of the compositions of the invention do not overlap with Sileo et al.'s Alloy 2. More specifically, claim 1 of the instant application requires *inter alia* about 12 - 18% cobalt, 4 - 9.5% molybdenum and 2 - 3.5% aluminum, while Sileo et al. Alloy 2 contains no cobalt, no molybdenum and 5.5 - 6.5% aluminum. Alloys 1 and 2 listed in Table 1 of Sileo et al., in the opinion of Mr. Smith, are not relevant to the instant claims since there is no overlap in the critical chromium ranges. Note that Sileo et al. teaches in Alloy 1 a chromium range of 5 - 18% and in Alloy 3 a chromium range of 15 - 19%, whereas in claim 1 of the instant application, a chromium range of about 21.5 - 28% is specified. Independent claim 7 requires about 21.5 - 27% chromium, while independent claim 13 of the instant application requires about 22 - 27% chromium, all of which are outside the chromium ranges of Alloys 1 and 2 of Sileo et al.

Thus, it is the opinion of Mr. Smith that the alloys of Sileo et al. do not suggest the claimed compositions of the present invention and, accordingly, the alloys defined in pending claims 1-19 are unobvious thereover.

The alleged invention disclosed by Sileo et al. resides in a method of making an abradable seal in which a plasma sprayed bond coat made from a metal powder forms a matrix for a composite containing 20 - 40 vol. % of boron nitride, which is also deposited as a thin film

on the bond coat by plasma spraying. The compositional limits of the bond coat are the broad ranges set forth in column 7, lines 48-59 of Sileo et al. discussed above. As pointed out in paragraph 10 of the Smith Declaration, the Sileo et al. disclosure is directed to a composition which is in powder form which is plasma sprayed to form merely a surface coating, thus, hot and cold workability is not required as is necessary in the present invention. In the opinion of Mr. Smith, persons skilled in the art who are interested in obtaining a wrought, nickel base alloy to which the present invention pertains, would not likely look to the plasma sprayed powder composite of Sileo et al. for any guidance.

Applicant Smith also points out in paragraph 11 of the enclosed Declaration that it must be appreciated that in claim 1 of the present application, as well as in the balance of the claims, molybdenum is present in the amount of 4.5 - 9.5 wt.%, whereas in Sileo et al. molybdenum is optionally present in an amount 0 to 4% by weight. Mr. Smith points out that molybdenum in the present invention is critical in the claimed range, contributing to solid solution strengthening and improved protective scale performance at intermediate temperatures. This claimed critical range for molybdenum is not suggested by Sileo et al., further evidencing the nonobvious nature of the present invention.

Finally, in paragraph 12 of the enclosed Declaration, Mr. Smith points out that titanium is an optional element from 0 - 5% in Sileo et al., while it is critically specified at 0.5 - 2% in claim 1 (and more narrowly in independent claims 7 and 13) for the purpose of deoxidation during manufacture and as a carbide (TiC) former which acts as a grain stabilizer during manufacture and service. The upper limit of 2% for Ti in claim 1 serves to limit the volume percent of γ'' that may form at intermediate temperatures. This feature is not recognized or suggested in Sileo et al., also evidencing the nonobvious advance of the presently claimed invention.

For the foregoing reasons, it is submitted that Applicants' claims, as amended, represent an unobvious advance over the cited prior art. The Examiner's favorable action is respectfully requested.

Respectfully submitted,

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